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U.S. Department of Transportation

Federal Aviation Administration

Prime Item Product Specification

for the

Host Interface Device /

NAS Local Area Network System

The Aircraft/Avionics Integrated Product Team
Aeronautical Data Link Program, AND-720

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1. SCOPE

1.1. General

This prime item product specification, developed in accordance with FAA-STD-005, MIL-STD-490 and FAA-G-2100F, establishes the functional (performance), test and delivery requirements for the Host Interface Device (HID), the Local Area Network (LAN), the HID/NAS LAN (HNL) Router, and the Network System Manager (NSM)—key components of the HID/NAS LAN system which is to be used in the National Airspace System (NAS) at the Air Route Traffic Control Centers (ARTCCs).

This specification is designed to provide requirements for those hardware and software components determined to be available as Commercial Off The Shelf (COTS). It is not intended to provide requirements for the complete HID/NAS LAN system which includes the HID and NSM application software being developed for the FAA under a separate contract (refer to 3.1.4).

A primary requirement of this specification is that any contractor-provided COTS hardware and software shall fully support the FAA-developed application software. Compliance with this requirement will be verified by testing prior to deployment of the equipment to field facilities. The testing will be performed at the FAA Technical Center in Atlantic City, New Jersey. (Refer to 3.11, Qualification.)

1.2. Background/Purpose

Development of the HID/NAS LAN system followed a decision to expand the Host Computer System (HCS) functionality by providing a common infrastructure for data communication between the HCS, user beneficial projects, and systems external to the ARTCC. The HID/NAS LAN is a subsystem being developed by the Data Link Integrated Product Team to provide an air/ground digital data communications link between aircraft and air traffic and flight information ground services. Other components being developed include: a) Host Data Link (HDL) software, and b) the Data Link Applications Processor (DLAP) hardware and software, both of which are in various stages of development and/or acquisition.

The goal is to use the HID/NAS LAN system and DLAP as the ARTCC-resident parts of the communications infrastructure between the HCS and the eventual user of ADLS services, as well as between the HCS and other user beneficial automation subsystems such as the CTAS, AERA, DSP, and ETMS. The HID/NAS LAN system will provide a common interface to the HCS for DLAP and other automation subsystems, and DLAP will provide an application gateway to support Open Systems Interconnection (OSI) protocols and minimize loading on the HCS.

A two-phased development approach was chosen to provide the necessary User Benefits Infrastructure (UBI). Phase 1, which includes the HID/NAS LAN system, involves the

acquisition and deployment of all system hardware and software specified herein. Phase 2 incorporates additional UBI users. The HID/NAS LAN system will provide early connectivity for CTAS and other UBI automation systems. Measurable user benefits will begin with the initial operating capability (IOC) of the en route data link functionality, i.e., when the ground-based communications infrastructure is complete and aircraft are equipped with compatible data link avionics.

2. APPLICABLE DOCUMENTS

Refer to Appendix 10 for a listing of applicable documents and documentation sources.

3. REQUIREMENTS

3.1. Prime Item Definition

3.1.1. HID/NAS LAN System

The HID, NAS LAN, HID/NAS LAN (HNL) Router, and NSM, together with the HID and NSM applications software being developed separately, comprise the HID/NAS LAN system (see Figure 3-1).

Within an ARTCC, the HID/NAS LAN system will provide for communications between the HCS and user systems such as the UBI Traffic Flow Management (TFM) systems and the DLAP (see Figure 3-2). These communications shall be in accordance with NAS-IR-40010001 NAS LAN/ User Interface Requirements Document. Using the HNL Router, the HID/NAS LAN system will also support communications between user systems and systems outside the ARTCC such as other ARTCCs, and TRACONs. The HID/NAS LAN system will acquire Universal Coordinated Time (UTC) data through the ARTCC Coded Time Source (CTS) interface and distribute these data to user systems. The NSM will provide a user interface for configuration, status, and performance reporting of the HID/NAS LAN system components. Additionally, the NSM will support administration of some user system databases and will communicate with the NAS Infrastructure Management System (NIMS) to support remote maintenance monitoring operations.

3.1.1.1. HID

The HID will provide an interface between HCS applications and applications resident on user systems (user systems include, but are not limited to the TFM and DLAP systems connected to the NAS LAN). The HID NAS/LAN system shall include two HID*s* at each ARTCC: a primary HID and a backup HID. Each HID shall include two HCS interface cards. Each HCS interface

card will connect to the HCS via an IBM block multiplexer channel. Each HID shall operate as a NAS element under HCS control.

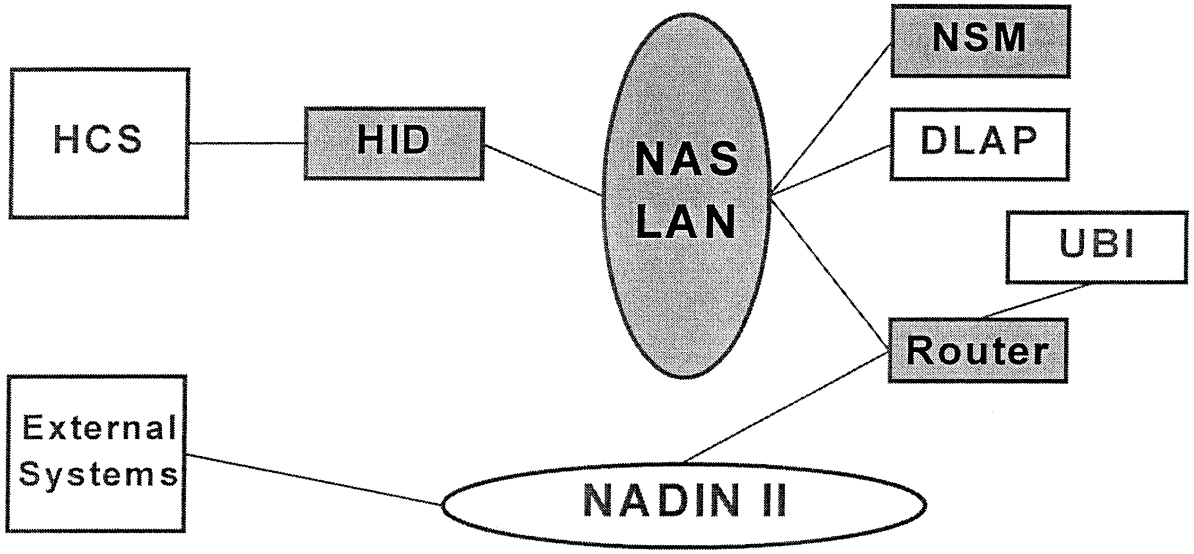

Figure 3-1. HID/NAS LAN System

At any given time, only one HID (either the primary or the backup) shall be providing communications between the HCS and the user systems. The remaining HID shall be capable of performing off-line functions under the control of the stand-by HCS. During normal operations, both HIDs shall be immediately available for operational use as controlled by the HCS. Failure of a HID shall not cause a switchover of any other NAS element or device.

The HID will include a Host Resources Management Information Base (MIB), as defined in Request for Comment (RFC) document RFC 1514, and consistent with the conventions of RFC 1212 and RFC 1213. The HID will include a management agent, accessing the MIBs of the HID and communicating with the NSM, as described by RFC 1155.

Each HID shall be capable of operating under control of the operating system software described in 3.1.1.6.1.

Each HID shall include an IBM Micro Channel Architecture (MCA)™ bus for the attachment of peripheral device adapters.

Each HID shall contain two HCS interface cards for attachment to bus and tag channels of the HCS. In addition, dual attachment Fiber Distributed Data Interface (FDDI) adapter cards within each HID shall be used to communicate with the NAS LAN.

The HID shall be mounted in a standard rack configuration as defined in FAA-G-2100F.

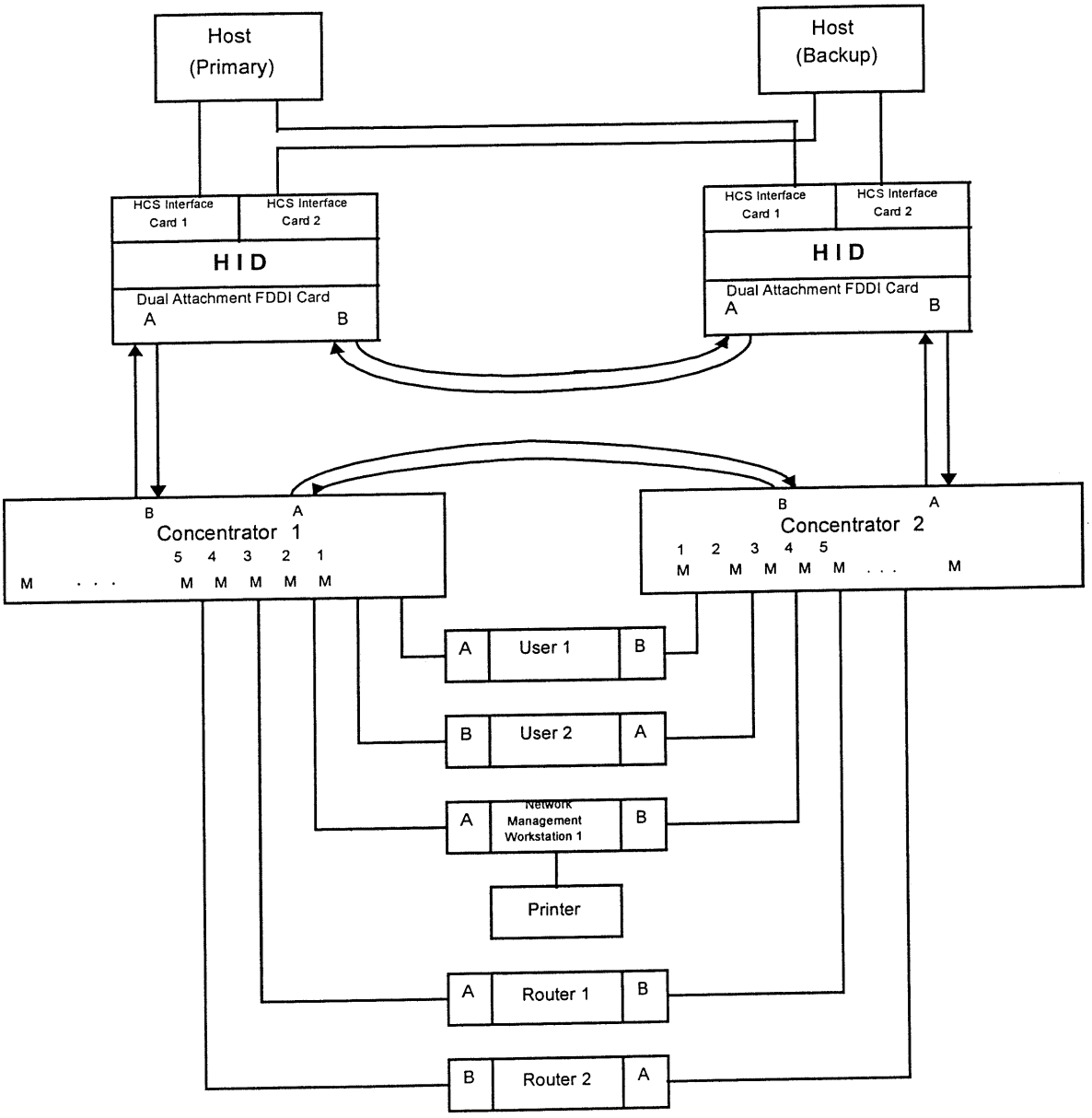

Figure 3-2. HID/NAS LAN Connectivity

3.1.1.2. NAS LAN

The NAS LAN shall support communications between the HCS and user systems including, but not limited to, the TFM systems and the DLAP. The NAS LAN shall include all concentrating devices, cables, and connectors necessary to form a high-performance, highly available local area network by connecting to the network adapters of the HID, HNL Router, NSM, and user systems.

The NAS LAN shall provide a local area FDDI network capable of digital data transmission at a rate of not less than 100 Mbps. The NAS LAN shall permit the connection of up to 500 devices.

The NAS LAN shall provide redundant paths for each communicating device such that the failure of one path connected to a communicating device shall not affect that device's ability to communicate using the NAS LAN. The failure of any device connected to the NAS LAN shall not affect the communications of any other device connected to the NAS LAN.

The NAS LAN components shall be mounted in a standard rack configuration as defined in FAA-G-2100F.

3.1.1.3 HNL Router

The HID NAS/LAN system shall include two HNL Routers at each ARTCC: a primary HNL Router and a backup HNL Router. The backup router shall operate in a hot standby mode. In the event of failure of the primary router, the backup router shall automatically assume the role of the primary router. The HNL Router shall support communications between user systems and systems outside the ARTCC such as NADIN nodes, adjacent ARTCCs and TRACONs. The HNL Router shall serve as a router for communications between user systems and systems outside the ARTCC. Also, the HNL Router shall serve as an Internet Protocol (IP) router between the existing Ethernet networks of the TFM systems and the NAS LAN. Using network access, the HNL Router shall be monitored and controlled from the NSM.

3.1.1.4 NSM

The NSM will be implemented using simple Network Management Protocol (SNMP) with standard Management Information Base (MIB's) for communication between compliant systems for remote maintenance, monitoring, and control.

The NSM shall include a workstation and network management software supporting operation of the HID/NAS LAN network. As described in RFC 1155, the NSM shall perform network management functions by manipulating the available MIBs of all HID/NAS LAN elements, and

the MIBs of all cooperating user systems. The NSM shall manipulate MIBs that follow the conventions of RFC 1212, RFC 1213 and RFC 1514.

The NSM shall be provided with a color monitor with a minimum 15.9 inch viewable image size, minimum 0.26 dot pitch, and maximum resolution of 1280x1024 pixels It shall also be provided with a keyboard featuring a 101 key layout and a pointing device such as a mouse or trackball.

The NSM shall include a printer capable of operation in a computer room environment (i.e., pressurized HVAC). No effect on the operation of any other ARTCC equipment shall result either from the routine maintenance of or the replenishment of consumables for this printer.

The NSM components shall be mounted in a standard rack configuration as described in FAA-G-2100F.

3.1.1.5 Equipment Rack

Equipment racks shall be of sufficient size to house all HID/NAS LAN system equipment and be provided with all wiring/outlets necessary to interconnect the enclosed equipment. Any equipment enclosures, including sliding tracks used to mount the equipment, shall not exceed 72 inches in overall height, 24 inches in overall frame width, and 30 inches in overall frame depth. In accordance with FAA-G-2100F, all power receptacles provided in the equipment racks shall be of a ANSI C73-73 twist lock style (L5-15R or equivalent).

3.1.1.6 System Support Software

The following paragraphs define the COTS software that shall be included with the HID/NAS LAN system. The functions provided by the supplied operating system, communications and maintenance software shall be fully compatible with the applications software being developed by the FAA for use with the HID/NAS LAN system (refer to 3.1.4).

3.1.1.6.1 Operating System Software

The operating system shall be POSIX-compliant as defined in FIPS 151-2.

The operating system shall have a command language and shall accept and process commands issued directly from directly connected CRT terminals.

3.1.1.6.2 Communications Software

Communications software shall be provided that fully supports the interface requirements described in this specification (refer to 3.1.2).

3.1.1.6.3 Maintenance Software

Maintenance software shall be provided to perform self testing, fault isolation, and fault recovery as described in this specification (refer to 3.2.4.3). The maintenance software shall provide fault detection to the LRU level. The outputs of the maintenance software shall be accessible by FAA-developed application software.

3.1.1.7 Prime item diagrams

See Table 6-1 in Section 6. for an example configuration of the HID/NAS LAN system.

3.1.2 Interface definitions

3.1.2.1. HCS/HID Interface

Each of the two HID*s* shall include two HCS interface cards. Each HCS interface card shall be configured to operate as a channel control unit connected to an HCS block multiplexer channel. The HCS interface card shall support the functions of a shared (multi-device) control unit as defined in the IBM 3083 block multiplexer channel specification (GA22-6974-10). Channel address assignments for the HCS will be provided by the Government. The physical HCS/HID interface shall be implemented using IBM block multiplexer channel cables.

Each HID shall be configured as a NAS element. Each HCS processor shall be capable of communicating with each HID. However, only one HID shall be operational at any time. The HCS processors will control the operational status of the HID.

3.1.2.2. CTS Interface

The HID/NAS LAN shall acquire Universal Coordinated Time (UTC) data from the ARTCC. For this purpose, an interface shall be implemented as defined in NAS-IR-92020000.

3.1.2.3. NAS LAN/HID Interface

Each HID shall be connected to the NAS LAN.

Each HID shall operate as an Internet host, supporting the protocols and providing the functions defined in RFC 1700, RFC 1123, RFC 791, RFC 950, RFC 919, RFC 922, RFC 792, RFC 1112, RFC 768, RFC 793, RFC 1119, RFC 1390, and RFC 826.

3.1.2.4. HNL Router Interfaces

The HNL Router shall be capable of supporting connection to NAS LAN, X.25, ISO 8802-3, and ISO 8802-5 subnetworks. The HNL Router shall provide the functions and support the protocols defined in ISO 10038, ISO 10589, ISO 9542, ISO 8473-1, ISO 8473-2, ISO 8473-3, ISO 8473-4, ISO 8473-5, ISO 8802-2, ISO 8802-3, ISO CD 8802-5, ISO 7776, ISO 4335, and RFC 1812. In addition, the HNL Router shall support policy-based routing using static tables.

The HNL Router shall be connected to NADIN II via an interface implemented as defined in NAS-IR-43020001.

The router shall be capable of concurrently routing IP and CLNP traffic over each subnetwork attached to a FDDI port.

The HNL Router shall simultaneously route both Open Systems Interconnection (OSI) and Internet Protocol (IP) protocols.

3.1.2.5 NSM Interfaces

As described in RFC 1157, the NSM shall perform network management functions by communicating with all HID/NAS LAN elements and cooperating user systems.

The NSM shall provide a user interface for configuration, status and performance monitoring of the HID/NAS LAN components and cooperating user systems.

The NSM shall provide a graphical user interface (GUI) supporting administration of the databases of cooperating user systems.

3.1.3. Major Component List

The HID/NAS LAN system shall consist of the following system elements:

a. HID (2)
b. NAS LAN (including at least two FDDI concentrators)
c. HNL Router (2)
d. NSM
e. Software (COTS)
f. Racks
g. Cables

The arrangement of the HID/NAS LAN equipment in the racks shall be proposed by the contractor and subject to FAA approval. Refer to Table 6.1 for a list of components used in the system that supported development of the GFE applications software..

3.1.4. Government Furnished Equipment (GFE)

HID/NAS LAN application software was developed for the Government by the Computer Sciences Corporation (CSC) under the ERSDS I and ERSDS II contracts for the example hardware configuration cited in Section 6. Notes. The software will be provided as GFE in support of pre-production testing (if required) and field installation/testing activities. HID/NAS LAN application software, without modifications, shall be executable on the HID/NAS LAN hardware.

3.1.5. Government Loaned Property

Not applicable.

3.2. Characteristics

3.2.1. Performance Characteristics

3.2.1.1. HID

The HID shall not delay messages that are encapsulated in a User Datagram Protocol (UDP) header more than an average value of 5 ms, (8 ms 90th percentile), for last byte in to first byte out, when HCS and NAS/LAN applications are active.

The HID shall support normal block multiplexer operation at 100 Kbits/per second or higher averaged over any 100 millisecond period.

When no user systems are active, the load that is imposed on the HCS by the HID/NAS LAN shall result in additional HCS CPU utilization of less than 3 % of total HCS CPU capacity.

3.2.1.2 NAS LAN

The NAS LAN shall provide to any attached device the capability to transmit digital data at a rate of not less than 100Mbps.

3.2.1.3 HNL Router

The HNL Router shall support data rates up to *56* kbps for each X.25 subnetwork connection, up to 10 Mbps for each ISO 8802-3 subnetwork connection, and up to 100 Mbps for each FDDI connection.

The HNL Router shall be able to process packets with a maximum transit time (measured from the time the last bit of a packet enters the router to the time the first bit of the same packet leaves the router) of 5 milliseconds or less. The mean transit time at 80% loading of all the I/O ports shall be 2.5 milliseconds, or less.

3.2.2. Physical Characteristics

3.2.2.1. Weight Limits

With all components installed, the cabinets and frames shall be designed for an average weight distribution of floor loading not to exceed 250 lb/ft^2.

3.2.2.2. Dimensional Limits

HID/NAS LAN equipment, documentation, and storage of spares shall occupy floor space of not more than 120 ft^2

3.2.2.2.1. Accessibility

Equipment units shall provide front access, or rear access, or both, as needed for maintenance and repair activities.

3.2.2.2.2 Access Clearance

Distance required for maintenance access between rows of equipment units shall be no less than 3 feet (0.6 m) for front and rear access.

3.2.2.3 Durability

The structural strength and rigidity of the equipment units shall be such that common carrier handling in loading, shipping, unloading, and setting into position for installation will not cause damage to any HID/NAS LAN component nor deformation to the equipment units.

3.2.2.4. Power Requirements

The HID/NAS LAN system shall operate on FAA-supplied electrical power services available within the ARTCC in compliance with FAA-G-2100F. These services will be provided from a site-available Power Conditioning System (PCS). Overload protection and further distribution shall be designed within the HID/NAS LAN. The HID/NAS LAN shall contain no more than seven single phase, fifteen ampere, 120 VAC circuits. The HID/NAS LAN power distribution requirements are:

1. Each equipment unit shall be provided with a single circuit breaker for supply-power overload protection, as well as a visible circuit breaker indicator.

2. Each equipment unit shall provide for the distribution of electrical power within the unit.

3. Power distribution shall be in accordance with the National Electrical Code (NFPA-70).

4. Circuit breakers shall be provided with a mechanical shield to prevent accidental tripping.

5. Design of the HID/NAS LAN shall be such that the removal of power from any component cannot damage that or any other component.

6. The HID/NAS LAN shall be designed to minimize the phase-to-phase load imbalance for three-phase power and meet the FAA load balance specified in FAA-STD-020.

7. External wiring and cabling that interfaces with the power source shall be in accordance with FAA-STD-032 and FAA-C-1217. All 15a, 110v receptacles shall be L5-15R twist-lock per ANSI C73-73.

3.2.2.5 Electrical

3.2.2.5.1 Grounding and Bonding

The HID/NAS LAN system grounding and bonding shall be in accordance with FAA-STD-019 and FAA-STD-020. The HID/NAS LAN grounding and bonding shall be compatible with that of other equipment interfacing with the HID/NAS LAN.

15
120
300
15
1800 Watts

3.2.2.5.2 Grounding Networks

3.2.2.5.2.1. AC Ground

A common AC ground derived from the AC power source in the ARTCC shall be used for all AC power in the system. The HID/NAS LAN AC neutral shall be kept separate from the equipment frame and signal grounds

3.2.2.5.2.2. Multipoint Ground

HID/NAS LAN chassis ground and communications ground shall be isolated from AC neutral and shall be connected to the ARTCC multipoint ground system. These connections shall be made with 2 insulated #4 cables each not to exceed 6 ft in length. These cables shall be marked with green tape at each end and at intervals each not exceeding 4 ft.

3.2.2.6. Wiring

All HID/NAS LAN equipment and wiring shall be in accordance with the applicable portions of the National Electrical Code NFPA-70. All rack mounted wiring and wiring bundles shall be of sufficient length to permit field level maintenance activities such as extending cards, modules and LRUs or other units of system equipment for troubleshooting.

3.2.2.7. Cooling

3.2.2.7.1. Internal Temperature

The internal temperature of an operating HID/NAS LAN shall stay within the operating limits of all HID/NAS LAN components without requiring special cooling equipment other than forced-air cooling using room temperature air.

3.2.2.7.2. Airflow

All equipment shall use simple cooling techniques based on conduction, radiation and free convection, using room air, to the maximum extent possible. Forced air cooling shall be used only when free air cooling is inadequate.

3.2.2.7.3. Forced-Air Cooling

Only explosion-proof motors shall be used to drive HID/NAS LAN fans or blowers if forced-air cooling is used.

3.2.3. Reliability

The HID/NAS LAN system is classified as an essential system. As such, the Mean Time Between Failure (MTBF) for non-critical equipment shall be at least 2190 hours.

3.2.4. Maintainability

3.2.4.1. Mean Time to Repair (MTTR)

The HID/NAS LAN shall achieve a MTTR of 0.5 hours, maximum, for all repairs and restoration of service

3.2.4.2. Line Replaceable Unit (LRU)

Equipment in the HID/NAS LAN shall be designed to expedite restoration of a system function interrupted through on-site replacement of LRUs. All LRUs shall be mounted in the equipment rack in such a manner that they are readily accessible to maintenance personnel. LRUs will be identified in the LSA process.

3.2.4.3. Fault-Isolation

The HID/NAS LAN shall include diagnostic software capable of providing fault isolation to the designated LRU level. The HID/NAS LAN shall be designed with remote maintenance monitoring capablity.

3.2.4.4. Preventive Maintenance

Preventive maintenance shall not interrupt the performance of any HID/NAS LAN system function. Preventive maintenance shall not be required more than 4 times per year.

3.2.4.5 Corrective Maintenance

Corrective maintenance to correct hardware or software failures shall not be required more than 4 times per year. Corrective maintenance to correct failures shall not interrupt or degrade the performance of any HID/NAS LAN system function.

3.2.5 Availability

The HID/NAS LAN shall have availability of 0.99977 or more. The Mean Time Between Failures (MTBF) shall be at least 2190 hours, based on Mean Time To Repair (MTTR) of 0.5 hours.

3.2.6 Remote Maintenance Monitoring

NIMS will communicate with the HID/NAS LAN system via the NSM which will be used to support remote maintenance monitoring operations.

A workstation connected to the NSM and running X-Window application will be provided in the maintenance monitoring area .

3.2.7 Environmental Conditions

The HID/NAS LAN shall be designed to comply with the following environmental conditions that may be encountered during the transportation, storage and operation of the system.

The HID/NAS LAN shall be designed for operating and non-operating environmental conditions defined in Table 3-1. All specification requirements for operating under service conditions shall be met when the equipment is operational. Operational service conditions, defined in 3.2.2.4, apply under all fixed or varying conditions of AC line voltage and frequency as defined in FAA-G-2100F. Non-operational conditions include shipping and handling, and storage.

Table 3-1 HID/NAS LAN Environment

Conditions	Temperature (degree C)	Relative Humidity (* See Note)	Altitude (feet above sea level)
Operational	$+16^0$ C to $+32^0$ C	8% to 80%	0 to 10,000
Non Operational	-40^0 C to $+85^0$ C	up to100%	0 to 50,000

* Note: Above 40^0 C, the relative humidity shall be based upon a dew point of 40^0 C.

3.3. Design and Construction

3.3.1 Materials, Processes and Parts.

Not applicable for COTS equipment.

3.3.2 Electromagnetic Radiation

The HID/NAS LAN equipment shall meet the conducted and radiated emission requirements of Federal Communications Commission (FCC) Rules and Regulations (FCC Part 15).

3.3.3 Labeling

Each item of equipment shall have an attached label and each LRU shall have a permanent serial number, in accordance with IEEE 200-75. This requirement is only mandatory when it can be applied by the contractor without purchasing made-to-order parts with special markings.

3.3.4 Workmanship

Not applicable for COTS equipment.

3.3.5 Interchangeability

Not applicable for COTS equipment.

3.3.6 Safety

The HID/NAS LAN system shall comply to applicable national standards in effect at the time of manufacture.

3.3.7 Human Engineering

Not applicable for COTS equipment.

3.4. Security

The HID/NAS LAN shall include security provisions of FAA-STD-045. The HID and NSM shall operate as a Class (C2) Controlled Access Protection, secure system in a trusted computer environment, as defined in Section 1 and Section 2 of the DOD, *Trusted Computer System*

Evaluation Criteria (Orange Book), CSS-STD-001-83. All HID/NAS LAN network management functions shall be performed at the NSM.

All communication between systems connected to the HID/NAS LAN and systems outside the ARTCC shall be through the HNL Router. The HNL Router shall filter access from systems outside the ARTCC and shall restrict access by filtering messages based on source and destination address, protocol, and port. The configuration and activation of these filters shall be controlled from the NSM only.

3.5 Documentation

Documentation required for operation and support of the HID/NAS LAN system, including both hardware and software, will include both COTS and contractor-developed documentation and shall be provided in accordance with the formats, quantities and submittal schedules specified in the HID/NAS LAN SOW.

3.6. Logistics

Logistics shall be accomplished by utilizing the MIL-STD-1388 process and applying other documentation as identified in the SOW.

3.7 Personnel and Training

Personnel and training shall be in accordance with the requirements of the SOW. FAA-STD-028 will be used to provide detailed guidance regarding training.

3.8. Configuration Management

Configuration Management shall be implemented consistent with FAA-STD-021 and in accordance with the requirements of the SOW.

3.9. Major component characteristics

Refer to Section 6. Notes, for the characteristics of the major HID, NAS LAN, HNL Router, and NSM components.

3.10. Precedence.

Order of precedence for this document shall be as described in FAR clause 52.215-33, Order of Precedence. The contractor shall notify the contracting officer of each instance on conflicting, or apparently conflicting, requirements.

3.11 Qualification

Any requirements for qualification of COTS items, such as verification/validation of performance prior to delivery (e.g., Pre-Production Testing or an Operational Capability Demonstration), shall be as required as defined in the HID/NAS LAN Statement of Work (SOW).

3.12 Standard Sample

A standard sample of the HID/NAS LAN system is not required.

4. QUALITY ASSURANCE PROVISIONS

4.1. General

Testing of the HID/NAS LAN by the contractor and Government shall ensure that all hardware and system support software/firmware is in accordance with all HID/NAS LAN contract requirements. All contractor test activities shall be in accordance with the SOW and approved HID/NAS LAN test plans. Applicable standards are listed in this section and in the SOW.

4.1.1. Responsibility for Tests

The Contractor shall submit to the Government for approval, a Contractor's Master Test Plan for the tests required in the following subparagraphs. Following the approval of all relevant test plans and procedures, the tests (hardware and/or software/ firmware, where appropriate) defined in the following subparagraphs shall be conducted.

The HID/NAS LAN shall be tested to demonstrate, verify, and validate compliance with all functional and performance requirements stated in this specification. HID/NAS LAN testing shall be based on a bottom-up building-block approach that takes a defined subset of HID/NAS LAN requirements and validates compliance of that building block with its requirements before proceeding to validate the next higher level of integration. Major test series shall progress from the subsystem level up to the system test level. Special test requirements shall be developed to accommodate each test phase. Functional capabilities of each successive building-block increase until the final building block implements all HID/NAS LAN system requirements. Test reports shall be written and submitted for review and regression tests shall be performed when required by the contract schedule. Regression tests shall consist of tests that are repeated after software or hardware changes have been implemented, or upon delivery of software updates.

4.1.2. Qualification Methods

The methodology used to verify adherence of the HID/NAS LAN to the requirements specified in Section 3 includes: inspection, analysis, demonstration, and test. (Refer to 4.5 for definition of these terms). These methods, used singularly or in combination with manual or automated techniques, are generally applicable to both developmental and operational testing. Each requirement and method of verification shall be presented in tabular form.

4.1.3. Test Level

The SOW will define the level of testing that shall be applied to each delivered system. HID/NAS LAN testing shall be structured in the following three categories:

1. Initial Qualification Test - Initial Qualification Test shall consist of verification of all specification requirements.

2. Factory Acceptance Test - Factory Acceptance Test (FAT) shall consist of pre-shipment system level testing.

3. Site Acceptance Test - Site Acceptance Test (SAT) shall consist of post-shipment system level testing.

4.1.3.1. Initial Qualification Test

This test shall be performed on the first delivered system (excluding the software development system) to verify compliance with all requirements of this specification.

4.1.3.2. Factory Acceptance Test

This test (otherwise known as a pre-shipment system test) is performed to validate the function of the system at the contractor test facility and is witnessed by the government. The FAT shall demonstrate the adequacy of the HID/NAS LAN design by testing all aspects of system function and performance as defined in this specification. The FAT plan shall define the range of tests, input data, and initialization requirements. Testing resources such as personnel, equipment, facilities and schedules shall also be identified. Upon the successful completion of the FAT, each HID/NAS LAN shall be transported to and installed at its intended field test environment.

4.1.3.3. Site Acceptance Test

This test (otherwise known as a field site installation and checkout test or a post-shipment system test) is performed by the contractor to validate the function of the system in its intended field test environment. Additionally, the SAT will demonstrate the adequacy of the design, packaging, handling, and transportation capability of the HID/NAS LAN in transit. With the successful completion of the SAT, each HID/NAS LAN shall be ready for government evaluation testing. The SAT plan shall present descriptions and test success criteria for transferring the HID/NAS LAN systems from the test environment to the FAA's ARTCC and for checkout testing. This SAT plan shall define the range of tests, input data, initialization requirements, expected output, and criteria for evaluating test results. Testing resources such as personnel, equipment, facilities, and schedules shall also be identified.

4.1.4. Quality Conformance Requirements

Each formal test plan shall delineate each specific HID/NAS LAN requirement to be demonstrated during the test. Included with each requirement shall be an indication of the method to be used to demonstrate the requirement, the expected output or results, and how the results will be analyzed to determine success or failure. In each formal test procedure, the requirement identification shall be noted at the beginning of the procedure steps which test the requirement. Requirement identification shall consist of the section/paragraph number used in Section 3 of this specification. Each test report shall contain a section that delineates all requirements demonstrated during the test, followed by an indication of the actual output or results and a statement concerning the success or failure of the demonstration. The Qualification Cross-Reference Table described in 4.5 shall be included and maintained in formal test plans. The test report for each test plan shall reflect the relative completeness of requirements satisfaction.

4.2. Formal Tests

Formal test requirements documents shall be developed for FAT and SAT phases. FAT and SAT requirements documents are to include reliability testing requirements. Formal test requirement documents and specified standards shall provide the basis for development of detailed Test Plans and Procedures documentation for FAT and SAT testing. The activities associated with the aforementioned tests shall be rigorously documented and controlled. Each test shall be documented with Test Plans, detailed Test Procedures and Test Reports per FAA-STD-024.

4.3. Formal Test Constraints

The configuration of the HID/NAS LAN shall remain the same during FAT and SAT testing.

4.4. Operational Test and Evaluation (OT&E)

OT&E testing, currently known as OT&E system testing, is performed by the ACT-350 organization located at the FAA Technical Center in Atlantic City, New Jersey. OT&E system testing consists of two components: (1) integration/operational testing, and (2) operational suitability and effectiveness testing, formerly known as shakedown testing.

4.4.1 FAA Technical Center OT&E System Testing

The Contractor shall deliver and install a HID/NAS LAN at the FAA Technical Center for the purpose of OT&E system testing by ACT-350. Exact quantities of OT&E equipment to be provided shall be specified in the Statement of Work. If required, the Contractor shall provide

engineering support services and hardware maintenance support services during OT&E system testing. OT&E system testing may also be performed by the FAA at a field site to test for operational suitability and effectiveness. OT&E system testing of this equipment will prove compliance with the requirements of this specification. In the event of failure, refer to 4.5.

4.5 Qualification Cross-Reference Table.

The following is a methodology used to verify adherence to requirements specified in Section 3. The verification methods include inspection, analysis, demonstration and test. Each requirement and method of verification shall be presented in tabular form.

These verification requirements shall be mandatory for use in all testing of the HID/NAS LAN. Where applicable, pass/fail criteria for each verified requirement shall be defined and placed in the appropriate documentation. Failure to "pass" the appropriate verification action(s) (inspection, analysis, demonstration, or test) shall be cause for rejection. Upon evaluation of the cause of the failure and the implementation of proper corrective measures, the verification in which the failure occurred shall be repeated. If the corrective action has an impact on prior verifications, if a computer program is changed, or if any hardware is changed, then the prior verification shall be repeated. The Qualification Cross-Reference Table (Table 4-1) shows the test methods that shall be used for verifying compliance with the requirements of the specification. Specific allocation of test requirements for the Initial Qualification Test, the SAT and the FAT, will be listed in the SOW. Each verification method is detailed in the following sections.

4.5.1. Inspection (I)

Inspection is verification by visual examination of the item, reviewing descriptive documentation and comparing the appropriate characteristics with a predetermined or referenced standard to determine conformance to requirements without the use of special laboratory equipment or procedures.

4.5.2. Analysis (A)

Analysis is verification by technical/mathematical evaluation or simulation using mathematical representation (i.e., mathematical models, algorithms, equation), charts, graphs, circuit diagrams, data reduction/recording and representative data to prove that an item meets specified requirements. Representative data may include data collected from previous or other equipment and system verifications.

4.5.3. Demonstration (D)

Demonstration is an uninstrumented test, where success is determined from observation alone. Included in this category are tests whose results can easily be determined on a pass-fail basis.

4.5.4. Test (T)

Test is verification, through systematic exercising of the item under all appropriate conditions with collection, analysis, and evaluation of quantitative data for predetermined performance characteristics. Acceptability of the item is determined by the comparison of the data with pre-established quantitative requirements and occurrences.

Table 4-1. Qualification Cross-Reference Table

Paragraph	Title	Method
3.	Requirements	-n/a-
3.1.1	Prime Item Definition	-n/a-
3.1.1.1	HID	I,D,T
3.1.1.2	NAS LAN	I,D,T
3.1.1.3	HNL Router	I,D,T
3.1.1.4	NSM	I,D,T
3.1.1.5	Equipment Rack	I,D,T
3.1.1.6	System Support Software	D,T
3.1.1.6.1	Operating System Software	D,T
3.1.1.6.2	Communications Software	D,T
3.1.1.6.3	Maintenance Software	D,T
3.1.1.7	Prime item diagrams	-n/a-
3.1.2	Interface Definitions	-n/a-
3.1.2.1	HCS/HID Interface	I,D,T
3.1.2.2	CTS Interface	I,D,T
3.1.2.3	NAS LAN/HID Interface	I,D,T
3.1.2.4	HNL Router Interface	I,D,T
3.1.2.5	NSM Interfaces	I,D,T
3.1.3	Major Component List	-n/a-
3.1.4	Government Furnished Equipment (GFE)	I,D,T
3.1.5	Government Loaned Property	-n/a-
3.2	Characteristics	-n/a-
3.2.1	Performance Characteristics	-n/a-
3.2.1.1	HID	D,T
3.2.1.2	NAS LAN	D,T
3.2.1.3	HNL Router	D,T
3.2.2	Physical Characteristics	-n/a-
3.2.2.1	Weight Limits	I
3.2.2.2	Dimensional Limits	I
3.2.2.2.1	Accessibility	I
3.2.2.2.2	Access Clearance	I
3.2.2.3	Durability	I
3.2.2.4	Power Requirements	T

3.2.2.5	Electrical	-n/a-
3.2.2.5.1	Grounding and Bonding	I
3.2.2.5.2	Grounding Networks	-n/a-
3.2.2.5.2.1	AC Ground	I
3.2.2.5.2.2	Multipoint Ground	I,T

Table 4-1. Qualification Cross-Reference Table (Cont'd)

3.2.2.6	Wiring	I
3.2.2.7	Cooling	-n/a-
3.2.2.7.1	Internal Temperature	D
3.2.2.7.2	Airflow	I
3.2.2.7.3	Forced-Air Cooling	I
3.2.3	Reliability	A,D
3.2.4	Maintainability	-n/a-
3.2.4.1	Mean Time to Restore (MTTR)	D
3.2.4.2	Line Replaceable Unit (LRU)	A
3.2.4.3	Fault-Isolation	D,T
3.2.4.4	Preventive Maintenance	I
3.2.4.5	Corrective MaintenanceI	I
3.2.5	Inherent Availability	A
3.2.6	Remote Maintenance Monitoring	I, T
3.2.7	Environmental Conditions	I, T
3.3	Design and Construction	-n/a-
3.3.1	Materials, Processes, and Parts	-n/a-
3.3.2	Electromagnetic Radiation	I
3.3.3	Labeling	I
3.3.4	Workmanship	-n/a-
3.3.5	Interchangeability	-n/a-
3.3.6	Safety	I
3.3.7	Human Engineering	I
3.4	Security	I, T
3.5	Documentation	-n/a-
3.6	Logistics	-n/a-
3.7	Personnel and Training	-n/a-
3.8	Configuration Management	-n/a-
3.9	Major component characteristics	-n/a-
3.10	Precedence	-n/a-
3.11	Qualification	I
3.12	Standard Sample	-n/a-

5. PREPARATION FOR DELIVERY

5.1. General

Marking for shipment shall be in accordance with MIL-STD-129, Marking for Shipment and Storage. Requirements for packaging, packing, and shipment shall in accordance with best commercial practice.

6. NOTES

6.1. General.

Table 6-1 lists the configuration of the system used for HID/ NAS LAN applications software development. Table 6-2 provides proposed network addressing for candidate HID/NAS LAN elements.

Table 6-1 HID/NAS LAN System Configuration (Development System)

Note: The following data reflects the configuration established for the HID/NAS LAN development testbed and is provided for general information purposes only.

ITEM NOMENCLATURE	PART NO.	QUANTITY
HOST INTERFACE DEVICE (HID):		
IBM RISC/6000 model C20	IBM-7009-C20	2
includes		
120 Mhz PowerPC 604 processor	No Part Number	2
1.1 GB SCSI-2 Disc Drive	IBM-7009-9130	2
3.5" 2.88 MB Disc Drive	IBM-7009-9282	2
Internal Quad-Speed CD ROM Drive	IBM-7009-9606	2
Language Group US English	IBM-7009-9300	2
Power Cord US/Canada	IBM-7009-9800	2
AIX 4.1.2 Software Preload US	IBM-7009-5005	2
Upgrade to 64 MB ECC Memory	IBM-7009-4025	2
5 GB Internal 8mm Tape Drive	IBM-7009-6147	2
FDDI Single Ring Adapter	IBM-7009-2724	2
FDDI Dual Ring Adapter	IBM-7009-2723	2
DSC/Camber IBM Channel Adapter	BMMA-01-61	4
Rack Mount Kit	No Part Number	2
NAS LAN:		
Cisco FDDI Concentrator (Base Unit, 2 slots)	WS-C1400	2
Cisco FDDI Concentrator (Line Card, 8 ports, MIC Multi-mode FDDI)	WS-X1441	4
Cable & Connectors	No Part Number	1
Equipment Rack	No Part Number	2

Table 6-1 (concluded) HID/NAS LAN System Configuration (Development System)

ITEM NOMENCLATURE	PART NO.	QUANTITY
NETWORK SYSTEM MONITOR (NSM):		
IBM RISC/6000 model C20	IBM-7009-C20	1
includes		
120 Mhz PowerPC 604 processor	No Part Number	1
1.1 GB SCSI-2 Disc Drive	IBM-7009-9130	1
3.5" 2.88 MB Disc Drive	IBM-7009-9282	1
Internal Quad-Speed CD ROM Drive	IBM-7009-9606	1
Language Group US English	IBM-7009-9300	1
Power Cord US/Canada	IBM-7009-9800	1
AIX 4.1.2 Software Preload US	IBM-7009-5005	1
Upgrade to 128 MB ECC Memory	IBM-7009-4026	1
5 GB Internal 8mm Tape Drive	IBM-7009-6147	1
FDDI Single Ring Adapter	IBM-7009-2724	1
FDDI Dual Ring Adapter	IBM-7009-2723	1
Upgrade 1.1 GB to 2.2 GB SCSI-2 Disk Drive	IBM-7009-3089	1
Power GXT150M Graphics Adapter	IBM-7009-2650	1
P70 17" SVGA Color Monitor	IBM-7009-3617	1
13W3 To 13W3 Display Cable	IBM-7009-4234	1
Keyboard, 101-Key, US English	IBM-7009-6010	1
Mouse	IBM-7009-6041	1
Printer	No Part Number	1
Rack Mount Kit	No Part Number	1
ROUTER:		
Modular Multi-Protocol Router	CISCO-4500-M	2
Ethernet Module (6 Ports)	NP-6E	2
Dual Attached Multimode FDDI Adapter	NP-F1-D-MM	2
Serial Port Adapter (4 Ports)	NP-4T	2
8MB Memory Upgrade (Replaces 4MB Shared Memory)	MEM-NP8S-R4-P	2
8MB Memory Upgrade (Replaces 4MB Flash Memory)	MEM-NP8F-R4-P	2
16MB Memory Upgrade (Replaces 8MB Main Memory)	MEM-NP16M-R4-P	2
EIA 530 Cable, Male DTE	CAB-530MT	2
Rack Mount Kit	ACS-NPRM	2
SOFTWARE LICENSE AND DISTRIBUTION		
Basic 1-Time Charge, Proc Grp D5, Unlimited Users (HID)	IBM-5765-393-3602	2
Basic MRM SPO CD-ROM (HID)	IBM-5692-AIX-1004	2
Basic 1-Time Charge, Proc Grp D5, Unlimited Users (NSM)	IBM-5765-393-3602	1
Basic MRM SPO CD-ROM (NSM)	IBM-5692-AIX-1004	1
EUI/NetView for AIX (NSM)	IBM-5765-527-0149	1
Netview 4.1.4/AIX SNMP Manager, 1-2 User License (NSM)	IBM-5765-527-0158	1
Cisco 4500/4700 IOS Enterprise Feature Set	SF-G45A-11.0.5	2
Cisco Concentrator WS-1400 SMARTnet Maintenance	CON-SNT-WS-C1400	1

Table 6-2 HID/NAS LAN Network Addressing

Site/Device		Subnetwork (Mask: 255.255.255.0)	(Mask: 255.255.0.0)								
WJHTC		FDDI	Ethernet (10. 151.)						X.25 (10. 151.)			
Device Name			e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
	ZCY HID1	10. 151. 1. 1										
	ZCY HID2	10. 151. 1. 2										
	ZCY NSM	10. 151. 1. 3										
	ZCY RTR1	10. 151. 1. 4	2.1	3.1	4.1	5.1	6.1	7.1	8.1	9.1	10.1	11.1
	ZCY RTR2	10. 151. 1. 5	2.2	3.2	4.2	5.2	6.2	7.2	8.2	9.2	10.2	11.2
	ZCY CON1	10. 151. 1. 6										
	ZCY CON2	10. 151. 1. 7										
	ZCY VRTR	10. 151. 1. 8										
FAAAC		FDDI	Ethernet (10. 151.)						X.25 (10. 151.)			
Device Name			e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
	ZOK HID1	10. 151. 12. 1										
	ZOK HID2	10. 151. 12. 2										
	ZOK NSM	10. 151. 12. 3										
	ZOK RTR1	10. 151. 12. 4	13.1	14.1	15.1	16.1	17.1	18.1	8.3	19.1	20.1	21.1
	ZOK RTR2	10. 151. 12. 5	13.2	14.2	15.2	16.2	17.2	18.2	8.4	19.2	20.2	21.2
	ZOK CON1	10. 151. 12. 6										
	ZOK CON2	10. 151. 12. 7										
	ZOK VRTR	10. 151. 12. 8										

Table 6-2 (continued) HID/NAS LAN Network Addressing

Denver ARTCC Device Name		FDDI	Ethernet (10. 151.)						X.25 (10. 151.)			
			e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
	ZDV HID1	10. 151. 22. 1										
	ZDV HID2	10. 151. 22. 2										
	ZDV NSM	10. 151. 22. 3										
	ZDV RTR1	10. 151. 22. 4	23.1	24.1	25.1	26.1	27.1	28.1	8.5	29.1	30.1	31.1
	ZDV RTR2	10. 151. 22. 5	23.2	24.2	25.2	26.2	27.2	28.2	8.6	29.2	30.2	31.2
	ZDV CON1	10. 151. 22. 6										
	ZDV CON2	10. 151. 22. 7										
	ZDV VRTR	10. 151. 22. 8										
Ft. Worth ARTCC Device Name		FDDI	Ethernet (10. 151.)						X.25 (			
			e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
	ZFW HID1	10. 151. 32. 1										
	ZFW HID2	10. 151. 32. 2										
	ZFW NSM	10. 151. 32. 3										
	ZFW RTR1	10. 151. 32. 4	33.1	34.1	35.1	36.1	37.1	38.1	8.7	39.1	40.1	41.1
	ZFW RTR2	10. 151. 32. 5	33.2	34.2	35.2	36.2	37.2	38.2	8.8	39.2	40.2	41.2
	ZFW CON1	10. 151. 32. 6										
	ZFW CON2	10. 151. 32. 7										
	ZFW VRTR	10. 151. 32. 8										
Los Angeles ARTCC Device Name		FDDI	Ethernet (10. 151.)						X.25 (			
			e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
	ZLA HID1	10. 151. 42. 1										
	ZLA HID2	10. 151. 42. 2										
	ZLA NSM	10. 151. 42. 3										
	ZLA RTR1	10. 151. 42. 4	43.1	44.1	45.1	46.1	47.1	48.1	8.9	49.1	50.1	51.1
	ZLA RTR2	10. 151. 42. 5	43.2	44.2	45.2	46.2	47.2	48.2	8.10	49.2	50.2	51.2
	ZLA CON1	10. 151. 42. 6										
	ZLA CON2	10. 151. 42. 7										
	ZLA VRTR	10. 151. 42. 8										

Ft. Worth ARTCC Device Name		FDDI	Ethernet (10. 151.)						X.25 (			
			e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
	ZFW HID1	10. 151. 32. 1										
	ZFW HID2	10. 151. 32. 2										
	ZFW NSM	10. 151. 32. 3										
	ZFW RTR1	10. 151. 32. 4	33.1	34.1	35.1	36.1	37.1	38.1	8.7	39.1	40.1	41.1
	ZFW RTR2	10. 151. 32. 5	33.2	34.2	35.2	36.2	37.2	38.2	8.8	39.2	40.2	41.2
	ZFW CON1	10. 151. 32. 6										
	ZFW CON2	10. 151. 32. 7										
	ZFW VRTR	10. 151. 32. 8										

Table 6-2 (continued) HID/NAS LAN Network Addressing

Los Angeles ARTCC Device Name	FDDI	Ethernet (10. 151.) e0	e1	e2	e3	e4	e5	X.25 (s0	s1	s2	s3
ZLA HID1	10. 151. 42. 1										
ZLA HID2	10. 151. 42. 2										
ZLA NSM	10. 151. 42. 3										
ZLA RTR1	10. 151. 42. 4	43.1	44.1	45.1	46.1	47.1	48.1	8.9	49.1	50.1	51.1
ZLA RTR2	10. 151. 42. 5	43.2	44.2	45.2	46.2	47.2	48.2	8.10	49.2	50.2	51.2
ZLA CON1	10. 151. 42. 6										
ZLA CON2	10. 151. 42. 7										
ZLA VRTR	10. 151. 42. 8										
Atlanta ARTCC Device Name	**FDDI**	**Ethernet (10. 151.) e0**	**e1**	**e2**	**e3**	**e4**	**e5**	**X.25 (s0**	**s1**	**s2**	**s3**
ZTL HID1	10. 151. 52. 1										
ZTL HID2	10. 151. 52. 2										
ZTL NSM	10. 151. 52. 3										
ZTL RTR1	10. 151. 52. 4	53.1	54.1	55.1	56.1	57.1	58.1	8.11	59.1	60.1	61.1
ZTL RTR2	10. 151. 52. 5	53.2	54.2	55.2	56.2	57.2	58.2	8.12	59.2	60.2	61.2
ZTL CON1	10. 151. 52. 6										
ZTL CON2	10. 151. 52. 7										
ZTL VRTR	10. 151. 52. 8										
Miami ARTCC Device Name	**FDDI**	**Ethernet (10. 151.) e0**	**e1**	**e2**	**e3**	**e4**	**e5**	**X.25 (s0**	**s1**	**s2**	**s3**
ZMA HID1	10. 151. 62. 1										
ZMA HID2	10. 151. 62. 2										
ZMA NSM	10. 151. 62. 3										
ZMA RTR1	10. 151. 62. 4	63.1	64.1	65.1	66.1	67.1	68.1	8.13	69.1	70.1	71.1
ZMA RTR2	10. 151. 62. 5	63.2	64.2	65.2	66.2	67.2	68.2	8.14	69.2	70.2	71.2
ZMA CON1	10. 151. 62. 6										
ZMA CON2	10. 151. 62. 7										
ZMA VRTR	10. 151. 62. 8										

Table 6-2 (continued) HID/NAS LAN Network Addressing

Chicago ARTCC Device Name	FDDI	Ethernet (10. 151.)						X.25 (			
		e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
ZAU HID1	10. 151. 72. 1										
ZAU HID2	10. 151. 72. 2										
ZAU NSM	10. 151. 72. 3										
ZAU RTR1	10. 151. 72. 4	73.1	74.1	75.1	76.1	77.1	78.1	8.15	79.1	80.1	81.1
ZAU RTR2	10. 151. 72. 5	73.2	74.2	75.2	76.2	77.2	78.2	8.16	79.2	80.2	81.2
ZAU CON1	10. 151. 72. 6										
ZAU CON2	10. 151. 72. 7										
ZAU VRTR	10. 151. 72. 8										
Indianapolis ARTCC Device Name	**FDDI**	**Ethernet (10. 151.)**						**X.25 (**			
		e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
ZID HID1	10. 151. 82. 1										
ZID HID2	10. 151. 82. 2										
ZID NSM	10. 151. 82. 3										
ZID RTR1	10. 151. 82. 4	83.1	84.1	85.1	86.1	87.1	88.1	8.17	89.1	90.1	91.1
ZID RTR2	10. 151. 82. 5	83.2	84.2	85.2	86.2	87.2	88.2	8.18	89.2	90.2	91.2
ZID CON1	10. 151. 82. 6										
ZID CON2	10. 151. 82. 7										
ZID VRTR	10. 151. 82. 8										
Kansas City ARTCC Device Name	**FDDI**	**Ethernet (10. 151.)**						**X.25 (**			
		e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
ZKC HID1	10. 151. 92. 1										
ZKC HID2	10. 151. 92. 2										
ZKC NSM	10. 151. 92. 3										
ZKC RTR1	10. 151. 92. 4	93.1	94.1	95.1	96.1	97.1	98.1	8.19	99.1	100.1	101.1
ZKC RTR2	10. 151. 92. 5	93.2	94.2	95.2	96.2	97.2	98.2	8.20	99.2	100.2	101.2
ZKC CON1	10. 151. 92. 6										
ZKC CON2	10. 151. 92. 7										
ZKC VRTR	10. 151. 92. 8										

Table 6-2 (continued) HID/NAS LAN Network Addressing

New York ARTCC Device Name	FDDI	Ethernet (10. 151.) e0	e1	e2	e3	e4	e5	X.25 (s0	s1	s2	s3
ZNY HID1	10. 151. 102. 1										
ZNY HID2	10. 151. 102. 2										
ZNY NSM	10. 151. 102. 3										
ZNY RTR1	10. 151. 102. 4	103.1	104.1	105.1	106.1	107.1	108.1	8.21	109.1	110.1	111.1
ZNY RTR2	10. 151. 102. 5	103.2	104.2	105.2	106.2	107.2	108.2	8.22	109.2	110.2	111.2
ZNY CON1	10. 151. 102. 6										
ZNY CON2	10. 151. 102. 7										
ZNY VRTR	10. 151. 102. 8										
Boston ARTCC Device Name	**FDDI**	**Ethernet (10. 151.) e0**	**e1**	**e2**	**e3**	**e4**	**e5**	**X.25 (s0**	**s1**	**s2**	**s3**
ZBW HID1	10. 151. 112. 1										
ZBW HID2	10. 151. 112. 2										
ZBW NSM	10. 151. 112. 3										
ZBW RTR1	10. 151. 112. 4	113.1	114.1	115.1	116.1	117.1	118.1	8.23	119.1	120.1	121.1
ZBW RTR2	10. 151. 112. 5	113.2	114.2	115.2	116.2	117.2	118.2	8.24	119.2	120.2	121.2
ZBW CON1	10. 151. 112. 6										
ZBW CON2	10. 151. 112. 7										
ZBW VRTR	10. 151. 112. 8										
Minneapolis ARTCC Device Name	**FDDI**	**Ethernet (10. 151.) e0**	**e1**	**e2**	**e3**	**e4**	**e5**	**X.25 (s0**	**s1**	**s2**	**s3**
ZMP HID1	10. 151. 122. 1										
ZMP HID2	10. 151. 122. 2										
ZMP NSM	10. 151. 122. 3										
ZMP RTR1	10. 151. 122. 4	123.1	124.1	125.1	126.1	127.1	128.1	8.25	129.1	130.1	131.1
ZMP RTR2	10. 151. 122. 5	123.2	124.2	125.2	126.2	127.2	128.2	8.26	129.2	130.2	131.2
ZMP CON1	10. 151. 122. 6										
ZMP CON2	10. 151. 122. 7										
ZMP VRTR	10. 151. 122. 8										

Washington ARTCC Device Name	FDDI	Ethernet (10. 151.) e0	e1	e2	e3	e4	e5	X.25 (s0	s1	s2	s3
ZDC HID1	10. 151. 132. 1										
ZDC HID2	10. 151. 132. 2										
ZDC NSM	10. 151. 132. 3										
ZDC RTR1	10. 151. 132. 4	133.1	134.1	135.1	136.1	137.1	138.1	8.27	139.1	140.1	141.1
ZDC RTR2	10. 151. 132. 5	133.2	134.2	135.2	136.2	137.2	138.2	8.28	139.2	140.2	141.2
ZDC CON1	10. 151. 132. 6										
ZDC CON2	10. 151. 132. 7										
ZDC VRTR	10. 151. 132. 8										

Table 6-2 (continued) HID/NAS LAN Network Addressing

Cleveland ARTCC Device Name	FDDI	Ethernet (10. 151.)						X.25 (			
		e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
ZOB HID1	10. 151. 142. 1										
ZOB HID2	10. 151. 142. 2										
ZOB NSM	10. 151. 142. 3										
ZOB RTR1	10. 151. 142. 4	143.1	144.1	145.1	146.1	147.1	148.1	8.29	149.1	150.1	151.1
ZOB RTR2	10. 151. 142. 5	143.2	144.2	145.2	146.2	147.2	148.2	8.30	149.2	150.2	151.2
ZOB CON1	10. 151. 142. 6										
ZOB CON2	10. 151. 142. 7										
ZOB VRTR	10. 151. 142. 8										
Memphis ARTCC Device Name	FDDI	Ethernet (10. 151.)						X.25 (			
		e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
ZME HID1	10. 151. 152. 1										
ZME HID2	10. 151. 152. 2										
ZME NSM	10. 151. 152. 3										
ZME RTR1	10. 151. 152. 4	153.1	154.1	155.1	156.1	157.1	158.1	8.31	159.1	160.1	161.1
ZME RTR2	10. 151. 152. 5	153.2	154.2	155.2	156.2	157.2	158.2	8.32	159.2	160.2	161.2
ZME CON1	10. 151. 152. 6										
ZME CON2	10. 151. 152. 7										
ZME VRTR	10. 151. 152. 8										
Jacksonville ARTCC Device Name	FDDI	Ethernet (10. 151.)						X.25 (			
		e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
JZX HID1	10. 151. 162. 1										
JZX HID2	10. 151. 162. 2										
JZX NSM	10. 151. 162. 3										
JZX RTR1	10. 151. 162. 4	163.1	164.1	165.1	166.1	167.1	168.1	8.33	169.1	170.1	171.1
JZX RTR2	10. 151. 162. 5	163.2	164.2	165.2	166.2	167.2	168.2	8.34	169.2	170.2	171.2
JZX CON1	10. 151. 162. 6										
JZX CON2	10. 151. 162. 7										
JZX VRTR	10. 151. 162. 8										
Oakland ARTCC Device Name	FDDI	Ethernet (10. 151.)						X.25 (			
		e0	e1	e2	e3	e4	e5	s0	s1	s2	s3
ZOA HID1	10. 151. 172. 1										
ZOA HID2	10. 151. 172. 2										
ZOA NSM	10. 151. 172. 3										
ZOA RTR1	10. 151. 172. 4	173.1	174.1	175.1	176.1	177.1	178.1	8.35	179.1	180.1	181.1
ZOA RTR2	10. 151. 172. 5	173.2	174.2	175.2	176.2	177.2	178.2	8.36	179.2	180.2	181.2
ZOA CON1	10. 151. 172. 6										
ZOA CON2	10. 151. 172. 7										
ZOA VRTR	10. 151. 172. 8										

Table 6-2 (concluded) HID/NAS LAN Network Addressing

Seattle ARTCC Device Name	FDDI	Ethernet (10. 151.) e0	e1	e2	e3	e4	e5	X.25 (s0	s1	s2	s3
ZSE HID1	10. 151. 182. 1										
ZSE HID2	10. 151. 182. 2										
ZSE NSM	10. 151. 182. 3										
ZSE RTR1	10. 151. 182. 4	183.1	184.1	185.1	186.1	187.1	188.1	8.37	189.1	190.1	191.1
ZSE RTR2	10. 151. 182. 5	183.2	184.2	185.2	186.2	187.2	188.2	8.38	189.2	190.2	191.2
ZSE CON1	10. 151. 182. 6										
ZSE CON2	10. 151. 182. 7										
ZSE VRTR	10. 151. 182. 8										
Houston ARTCC Device Name	FDDI	Ethernet (10. 151.) e0	e1	e2	e3	e4	e5	X.25 (s0	s1	s2	s3
ZHU HID1	10. 151. 192. 1										
ZHU HID2	10. 151. 192. 2										
ZHU NSM	10. 151. 192. 3										
ZHU RTR1	10. 151. 192. 4	193.1	194.1	195.1	196.1	197.1	198.1	8.39	199.1	200.1	201.1
ZHU RTR2	10. 151. 192. 5	193.2	194.2	195.2	196.2	197.2	198.2	8.40	199.2	200.2	201.2
ZHU CON1	10. 151. 192. 6										
ZHU CON2	10. 151. 192. 7										
ZHU VRTR	10. 151. 192. 8										
Albuquerque ARTCC Device Name	FDDI	Ethernet (10. 151.) e0	e1	e2	e3	e4	e5	X.25 (s0	s1	s2	s3
ZAB HID1	10. 151. 202. 1										
ZAB HID2	10. 151. 202. 2										
ZAB NSM	10. 151. 202. 3										
ZAB RTR1	10. 151. 202. 4	203.1	204.1	205.1	206.1	207.1	208.1	8.41	209.1	210.1	211.1
ZAB RTR2	10. 151. 202. 5	203.2	204.2	205.2	206.2	207.2	208.2	8.42	209.2	210.2	211.2
ZAB CON1	10. 151. 202. 6										
ZAB CON2	10. 151. 202. 7										
ZAB VRTR	10. 151. 202. 8										
Salt Lake City ARTCC Device Name	FDDI	Ethernet (10. 151.) e0	e1	e2	e3	e4	e5	X.25 (s0	s1	s2	s3
ZLC HID1	10. 151. 212. 1										
ZLC HID2	10. 151. 212. 2										
ZLC NSM	10. 151. 212. 3										
ZLC RTR1	10. 151. 212. 4	213.1	214.1	215.1	216.1	217.1	218.1	8.43	219.1	220.1	221.1
ZLC RTR2	10. 151. 212. 5	213.2	214.2	215.2	216.2	217.2	218.2	8.44	219.2	220.2	221.2
ZLC CON1	10. 151. 212. 6										
ZLC CON2	10. 151. 212. 7										
ZLC VRTR	10. 151. 212. 8										

APPENDIX 10

APPLICABLE DOCUMENTS AND SOURCES

SECTION 10-1

GOVERNMENT DOCUMENTS

10.1. Government Documents

The following documents form a part of this specification and are applicable to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this hardware specification, the contents of this specification shall take precedence.

10.1.1. Specifications

FAA:

FAA-G-2100F	Electronic Equipment General Requirements

10.1.2. Standards

FAA:

FAA-STD-005d	Preparation of Specification Documents
FAA-STD-019	Lighting Protection, Grounding, Bonding and Shielding Requirements for Facilities
FAA-STD-020B	Grounding, Transient Protection, and Shielding Requirements for Equipment
FAA-STD-021	Configuration Management
FAA-STD-024	Preparation of Test and Evaluation Documentation
FAA-STD-028	Contract Training Programs
FAA-STD-045	NAS OSI Security Architecture, Protocols and Mechanisms

Military:

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-490	Military Standard Specification Practices
MIL-STD-1388-1	Logistics Support Analysis

MIL-STD-1388-2 Logistics Support Analysis, Data Element

10.1.3. Other Government Documents

Department Of Defense:

DOD, Trusted Computer System Evaluation Criteria (Orange Book) CSS-STD-001-83

Federal:

FCC Rules and Regulations Part 15

FAA Documents:

NAS-IR-40010001 NAS LAN/ User Interface Requirements Document

NAS-IR-43020001 NADIN/ X.25 Packet Mode User Interface Requirements Document

NAS-IR-92020000 Coded Time Source (CTS)/ User Systems Interface Requirements Document

SECTION 10-2
NON-GOVERNMENT DOCUMENTS

10.2 Non-Government Documents

The following documents form a part of this specification and are applicable to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this hardware specification, the contents of this specification shall take precedence.

10.2.1 Electronics Industries Association (EIA) Documents

EIA 530	High Speed 25-Position Interface for Data terminal Equipment and Data Circuit Terminating Equipment

10.2.2 Institute of Electrical and Electronic Engineers (IEEE) Document

IEEE 200-1975	Reference designation for Electrical and Electronic Parts and Equipment.

10.2.3 International Organization for Standardization (ISO) Documents

ISO 4335: 1993	Data Communication - High Level Data Link Control Procedures Elements of Procedures
ISO 7776: 1986	Information Processing Systems - Data Communications High-Level Data Link Control Procedures - Description of the X.25 LAPB-compatible DTE Data Link procedures
ISO 8208:1990	Information Technology - Data Communications - X.25 Packet Layer Protocol for Terminal Equipment (revision of Second Edition)
ISO 8473-1:1994	Information Technology - Protocol for providing the Connectionless-mode Network Service - Part 1: Protocol Specification
ISO 8473-2:1994	Information Technology - Protocol for providing the Connectionless-mode Network Service - Part 2: Provision of the Underlying Service by ISO 8802 Subnetworks
ISO 8473-3:1995	Information Technology - Protocol for providing the Connectionless-mode Network Service - Part 3: Provision of the Underlying Service by ISO 8208 Subnetworks
ISO 8473-4:1995	Information Technology - Protocol for providing the

	Connectionless-mode Network Service - Part 4: Provision of the Underlying Service by Subnetworks that Provide the OSI Data Link Service
ISO 8802-2:1990	Information Processing Systems - Local Area Networks - Part 2: Logical Link Control
ISO 8802-3:1993	Information Processing Systems - Local Area Networks - Part 3: Carrier Sense Multiple Access with Collision Detection - Access Method and Physical Layer Specification
ISO CD 8802-5	Information Processing Systems - Local Area Networks - Part 5: Token Ring Access Method and Physical Layer Specification
ISO 9542:1988	Information Processing Systems - Telecommunications and Information Exchange between Systems - End System to Intermediate System Routing Information Exchange Protocol for Use in Conjunction with the Protocol for the Provision of the Connectionless-mode Network Service
ISO 10038:1993	Information Processing Systems - Telecommunications and Information Exchange between Systems - Local Area Networks - Media access control (MAC) bridges
ISO 10589:1994	Information Processing Systems - Telecommunications and Information Exchange between Systems - Intermediate System to Intermediate System Routing Information Exchange Protocol for Use in Conjunction with ISO 8473

10.2.4 Internet Standards Documents

STD 2, RFC 1700	Assigned Numbers
STD 3, RFC 1122	Host Requirements - Communications
STD 4, RFC 1123	Host Requirements - Applications
STD 5, RFC 791	Internet Protocol, as amended by— RFC 950, IP Subnet Extension RFC 919, IP Broadcast Datagrams RFC 922, IP Broadcast Datagrams with Subnets
STD 5, RFC 792	Internet Control Message Protocol

STD 5, RFC 1112	Internet Group Multicast Protocol
STD 6, RFC 768	User Datagram Protocol
STD 7, RFC 793	Transmission Control Protocol
STD 12, RFC 1119	Network Time Protocol (Version 2)
STD 15, RFC 1157	A Simple Network Management Protocol (SNMP)
STD 16, RFC 1212	Concise MIB Definitions
STD 17, RFC 1213	Management Information Base-II
STD 36, RFC 1390	Transmission of IP and ARP over FDDI Networks
STD 37, RFC 826	Address Resolution Protocol

10.2.5 Internet Request For Comment (RFC) Documents

RFC 1155	Structure of Management Information
RFC 950	IP Subnet Extension
RFC 919	IP Broadcast Datagrams
RFC 922	IP Broadcast Datagrams with Subnets
RFC 1514	Host Resources MIB
RFC 1812	Requirements for IP Version 4 Routers

10.2.6 International Business Machine (IBM) Documents

GA22-7000-7	IBM System 370, Principles of Operation
GA22-6974-10	IBM System 360 and System 370 I/O Interface to Control Unit OEM's

10.2.7 Other Non-Government Documents

ASTM-D-3591-82, Standard Practices for Commercial Packing

SECTION 10-3

DOCUMENTATION SOURCES

10.3. Documentation Sources

10.3.1. FAA Documents

Copies of FAA specifications, standards, and publications may be obtained from the Contracting Officer, FAA, 800 Independence Avenue, S.W., Washington, D.C. 20591. Requests should clearly identify the desired material by number and state the intended use of the material.

10.3.2. Military and Federal Documents

Single copies of unclassified military and federal specification, standards, and publications may be obtained by writing the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120 or by calling (215) 697-3321 Monday through Friday, 8:00 a.m. to 4:30 p.m. (EST).

10.3.3. Electronic Industries Association Documents

Copies of Electronic Industries Association (EIA) standards may be obtained from the Electronic Industries Association, 2001 Eye Street, NW, Washington, D.C. 20006.

10.3.4. American Society of Testing and Materials Documents

Copies of American Society of Testing and Materials (ASTM) materials may be obtained from the American Society of Testing and Materials, 1916 Race Street, Philadelphia, PA 19103, or by calling (215) 299-5400.

10.3.5. National Telecommunications and Information Administration Documents

Copies of National Telecommunications and Information Administration (NTIA) materials may be obtained from NTIA, Department of Commerce, 14th Street and Constitution Avenue, Washington, D.C. 20230, or by calling (202) 377-1832.

10.3.6. Internet Standards and RFC Documents

Copies of Internet Standards and Request for Comment documents may be requested through electronic mail from the interNIC Directory and Database Services automated mail server by sending a message to mailserve@ds.internic.net. In the body of the message, include the following command: document-by-name rfcNNNN (NNNN is the number of the RFC).

10.3.7. Institute of Electrical and Electronic Engineers (IEEE) Documents

Copies of IEEE documents may be obtained by writing the Institute of Electrical and Electronic Engineers, Inc., 345 East 47th Street, New York, NY 10017.

10.3.8. International Organization for Standardization (ISO) Documents

Copies of ISO documents may be obtained by writing the American National Standards Institute (ANSI), 11 west 42nd Street, New York, NY 10109-1455.

10.3.9. International Business Machine (IBM) Documents

Copies of IBM documents may be obtained by writing IBM, Old Orchard Rd., Armonk, NY 10504.

APPENDIX 20

GLOSSARY

SECTION 20

GLOSSARY

ADLS	Aeronautical Data Link System
AERA	Automated En Route Air Traffic Control
ARTCC	Air Route Traffic control Center
BER	Bit Error Rate
CLNP	Connectionless-mode Network Protocol
COTS	Commercial Off The Shelf
CPU	Central Processing Unit
CRT	Cathode Ray Tube
CSC	Computer Sciences Corporation
CTAS	Center TRACON Automation System
CTS	Coded Time Source
DLAP	Data Link Applications Processor
DSP	Departure Sequencing Program
EIA	Electronic Industry Association
ERSDS	En Route Software Development and Support
ES	End System
ETMS	Enhanced Traffic Management System
FAA	Federal Aviation Administration
FDDI	Fiber Distributed Data Interface
GFE	Government Furnished Equipment
GUI	Graphical User Interface
HCS	Host Computer System
HDL	Host Data Link
HID	Host Interface Device
HNL	HID/NAS LAN
HVAC	Heating, Ventilation, and Air Conditioning
IBM	International Business Machines
ICAO	International Civil Aviation Organization
I/O	Input/Output
IOC	Initial Operating Capability
IP	Internet Protocol

IS	Intermediate System
ISO	International Organization for Standardization
ITU	International Telegraph Union
Kbps	Thousand bits per second
LAN	Local Area Network
LRU	Line Replaceable/Repairable Unit
Mbps	Million bits per second
MIB	Management Information Base
MTBF	Mean Time Between Failures
MTTR	Mean Time to Repair
NADIN	National Airspace Integrated Interchange Network
NAS	National Airspace System
NIMS	NAS Infrastructure Management System
NSM	Network System Manager
OSI	Open System Interconnection
PCS	Power Conditioning System
POSIX	Portable Operating System Interface
RFC	Request For Comment
SNMP	Simple Network Management Protocol
TBD	To Be Determined
TCP	Transmission Control Protocol
TFM	Traffic Flow Management
TRACON	Terminal Radar Approach Control
UBI	User Benefits Infrastructure
UTC	Universal Coordinated Time
UDP	User Datagram Protocol
WAN	Wide Area Network